Architecture in Future Cars – a Challenge Supported by the Vinnova MARCH Project

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Retrospective: Why in-car networks?

1. Single system with controller and devices.
2. Multiple, isolated systems
3. Information sharing by wiring
4. Lack of space → CAN bus
Topology 1998: ~20 ECUs, 2 CAN networks
Topology 2012: ~80 ECUs, inherited from 1998
Tomorrow

- Situation awareness
- Manoeuvres will involve many devices (actuators and sensors)
- Decisions cannot be decided on device level
Next generation architecture

- Subsystem partitioning
- Master nodes (ECUs)
Consequences (and vision)

- Centralised decision making — OEM IP in master nodes
- Enables complexity-reduction of standard nodes
- Fewer nodes
- Reduced bus load within sub-nets
- Paradigm shift:
  - AUTOSAR necessary
  - Software may be purchased separately from hardware
  - New business model needed
  - Liability and responsibility between/within OEM and suppliers:
    Function – Subsystem – ECU – Component
Model based approaches will be needed

- Dramatic increase of functional, dynamic and algorithmic complexity raises need for effective work with:
  - Well-defined component interfaces
  - Identifying organisational responsibilities and liabilities
  - Increasing precision of requirements
  - Iterative work

- Focus shift:
  - OEM IP in master nodes: Specification activities → Design activities
  - Standard nodes: Detailed specification → Interfaces and observable behaviour
Model based approaches will be needed, cont’d

• Communication between people
  • Visual, graphical notation
  • Introduction(!) of abstraction levels and aspect-oriented views (this is not common practice in automotive...)

• Increased knowledge of our systems and components will enable:
  • Re-use
  • Earlier and extended verification and validation
MARCH
Methodologies for Architecture Development and Evaluation
DFEA2020 Sub Project 2

• Architectural paradigm shift must be supported by new processes and methods
  • Present processes and methods based on existing architectures and organisation
  • Development must excel to achieve excellent products… of course

• MARCH shall — based on current operations in the automotive industry, which are function-centric and document driven — define strategies and methods to support architectural-centric design, utilizing model-based approaches.

• MARCH is a co-operation between Vinnova, Volvo Car Corporation and Know IT Technology Management